Duration : 2 hours   Marks: 50

Instructions: 1. Attempt all questions
2. Figures to the right indicate full marks.

Q.1. Fill in the blanks: **(10×1=10)**

a) Prime factorization of 972 is _____ .

b) If $f(x) = 5x^2 - 2x$, then $\int_1^2 f(x)dx =$_____.

c) If $\sin\frac{3}{5}$ and $\cos\frac{4}{5}$, then $tan\theta=$ _____.

d) If $y = x^4 - 5x^2$, then $y' =$ _____.

e) $\lim_{x\to 0} \frac{a^x - 1}{x}$ _____.

f) gcd(68,154)= _____.

g) Area of circle with centre 2cm is given by _____ cm^2.

h) In an A.P. $a = 5$ and $d = 4$, then $S_6 =$ _____.

i) Let $\begin{bmatrix} 1 & -3 & -2 \\ 4 & 0 & 7 \\ 5 & 2 & 8 \end{bmatrix}$, then $A' =$_____.

j) Let $Z_1 = 3 - 4i$ and $Z_2 = -7 + 8i$, then $Z_1 + \overline{Z_2}=$ _____.

Q.2. Answer the following questions.

a) Find the area of a parallelogram whose adjacent sides are $3\hat{\imath} + 4\hat{\jmath} - \hat{k}$
   and $4\hat{\imath} - 2\hat{\jmath} + 5\hat{k}$ (3)

b) Use De Moivre's theorem to prove that $sin2\theta = 2sin\theta cos\theta$.   (2)

c) If $= \begin{bmatrix} 5 & 7 \\ 4 & -1 \end{bmatrix}$, find $4A^2 + 3A - 2I$.   (5)

OR

d) Find the area of triangle whose sides are $2\hat{\imath} + 4\hat{\jmath} - \hat{k}$ and $-\hat{\imath} + \hat{\jmath} - 3\hat{k}$. (3)

e) Let $Z = 2 + 3i$, verify $z\bar{z} = |z|^2$.   (2)

f) Solve the following system of equations by using Cramer's Rule.   (5)
   $2x - 4y + 3z = 4,$ $x + y + z = 2,$ $3x + y - z = 2$

Q.3. Answer the following questions.
a) Check whether the vectors $a = 2\hat{\imath} - 4\hat{\jmath} + 3\hat{k}$ and $b = 3\hat{\imath} + 6\hat{\jmath} + 6\hat{k}$ are perpendicular.   (2)
b) A solid sphere of radius 5cm is mounted on a cube of side 9cm. Find the total volume.   (3)

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c) Two numbers are such that their ratio is 4:5 when 4 is added to the first number and 3 is subtracted from the second one the ratio becomes 4:1. Find the two numbers. (5)

OR

d) Find angle between the two vectors $a = \hat{\imath} - 2\hat{\jmath} + \hat{k}$ and $b = 2\hat{\imath} + \hat{\jmath} - 3\hat{k}$ (2)

e) The diameter of a cone is 10m and its slant height is 13m. Find its volume. (3)

f) The sum of three numbers is 98. If the ratio of the first to second is 2:3 and that of the second to the third is 5:8, then find the three numbers. (5)

Q.4. Answer the following questions.

a) Let $Z_1 = -3 + 4i$ and $Z_2 = 2 + 5i$. Verify $Z_1 Z_2 = Z_2 Z_1$. (2)

b) Find the three numbers in A.P. whose sum is 27 and product is 585. (3)

c) Check whether (2,1), (6,5) and (4,7) are the vertices of a right angled triangle. (5)

OR

d) Find $\frac{Z_1}{Z_2}$ if $Z_1 = 1 + i$ and $Z_2 = 1 - i$. (2)

e) Find the three numbers in G.P. whose sum is 39 and product is 729. (3)

f) Find the equation of line passing through (2,1) perpendicular to the line through (-3,-1) and (-1,2). (5)

Q.5. Answer the following questions.

a) Let $f(x) = x^2 + 2$ and $g(x) = logx$. Find $(f \circ g)(x)$. (2)

b) Let $f(x) = \frac{x^2 - 8x + 16}{x^2 - 16}$, find $\lim_{x \to 4} f(x)$. (2)

c) Examine the function $f(x) = x^2 + 4x$ for maxima or minima. (3)

d) Evaluate $\int_0^1 x^2 + e^x + \frac{1}{x^2} \, dx$. (3)

OR

e) Check whether $f(x) = \begin{cases} x^2, & x \le 0 \\ -x^2, & x > 0 \end{cases}$ is continuous. (2)

f) Find $\lim_{x \to 2} \frac{x^3 - 8}{x - 2}$. (2)

g) Examine the function $f(x) = 2x^2 - 5x$ for maxima or minima. (3)

h) Evaluate $\int_0^2 \sin x - 2^x dx$. (3)

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